
I. *The Longitude of* Lisbon, *and the Fort of* New York, *from* Wanſted *and* London, *determin'd by Eclipſes of the Firſt Satellite of* Jupiter. *By the Reverend Mr.* James Bradley, M. A. Aſtron. Prof. Savil. R. S. S.

SOME curious Aſtronomical Obſervations having lately been communicated to this Society from *Lisbon*, among which were ſeveral Eclipſes of the firſt Satellite of *Jupiter** ; I was willing to examine whether I had made any at *Wanſted* which tallied with them, that by comparing ſuch together, the true Difference of Longitude between thoſe Places might be found. But looking over my Obſervations of the firſt Satellite, made laſt Year and the beginning of this, I meet only with Two Emerſions that were obſerved the ſame Night both at *Lisbon* and *Wanſted.* There are others, indeed, made within a few Days of each other, which may likewiſe be made uſe of to determine the Difference of Longitude ; but not with the ſame degree of Certainty, by reaſon of the irregular Motion of the Satellite ; which I preſume, chiefly ariſes from the Gravity of the other Satellites towards it. For altho' the Effect of the Influence that the Satellites have on each other, is moſt remarkable in the Second, whoſe Motion will ſometimes be accelerated or retarded thereby, as much as amounts to 30 or 40 Minutes in time, in the ſpace of about ſeven Months, or in half the Period in which the three innermoſt Satellites return, to have nearly the ſame Poſition with reſpect to themſelves, and the Shadow of *Jupiter* ; yet the firſt

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* *Vide* Page 90.

ſeems alſo liable to Inequalities that cannot well be accounted for, but from ſome ſuch Cauſe as is before-mentioned, the effect of which will not eaſily be reduced to any Rule, but from a long and exact Series of Obſervations. And till ſome better and more certain Rule can be found out, we may ſuppoſe, that the Effect produced by this Cauſe, is, during ſmall Intervals, proportionable to the time. On this Suppoſition I have compared ſome Obſervations with others not made the ſame Nights; and the reſult is nearly the ſame as in thoſe which were obſerved at the ſame time in both Places, as will appear by the following Particulars.

The Immerſion of the Firſt Satellite was obſerved at *Wanſted* with Mr. *Hadley*'s Reflecting Teleſcope on *Auguſt* 4, N.S. 1725, about 45″ after the time of the Immerſion, as calculated from my Tables. By another Obſervation made *Auguſt* 29, N.S. the true Immerſion preceded the Calculation from the ſame Tables 1′ 10″. So that in 25 Days the Satellite's Motion was accelerated as much as anſwer'd to 1′ 55″ in time. Suppoſing therefore the Acceleration to have been in the ſame proportion between *July* 28, and *Auguſt* 4, N.S. then the true Immerſion *July* 28, N.S. would have happen'd at *Wanſted* about 1′ 15″ after the time by the Tables, which make the Immerſion at 12 h. 48′ 45″ App. Time. The true Immerſion therefore was at *Wanſted* *July* 28, N.S. 12h. 50′ 0″ App. Time; and at *Lisbon* 'twas obſerved at 12h. 12′ 26″ App. Time, the Difference being 37′ 34″.

September 28, N.S. the Firſt Satellite was ſeen emerging in the Reflecter at *Wanſted* 3′ 50″ ſooner than the Tables make the Emerſion; and by the Mean of two more Obſervations made at the ſame Place, and with the ſame Teleſcope, on the 14*th* and 16*th* of *October*, N.S. the true Emerſion preceded the Calculation

lation 4′ 30″. We may therefore from hence conclude, that on *Sept.*21, N.S. the true Emerſion at *Wanſted* preceded the Calculation by the Tables about 3′ 35″, and that the true Emerſion there was at 12h. 1′ 15″ *Apr.*1; but this Emerſion was obſerved at *Lisbon* at 11h. 24′ 55″, the Difference being 36′ 20″.

The Obſervations at *Wanſted* being made with Mr. *Hadley*'s Reflecting Teleſcope (by which one may ſee the Firſt Satellite near ¼ of a Minute ſooner when 'tis Emerging, than in a Refracting Teleſcope of 15 Feet, and the contrary when 'tis Immerging) there ought to be ſome Allowance made on account of different Teleſcopes made uſe of at *Lisbon* and *Wanſted*, by deducting 10 or 15″ from the Difference of Time collected from the Immerſions, and adding as much to the Difference deduced from the Emerſions. Such Correction being made, the Difference of Meridians by the Immerſion obſerved *July* 28, will be 37′ 20″, and by the Emerſion *Sept.* 21, 36′ 35″.

The Emerſion obſerved at *Lisbon*, *Decemb.* 8, N.S. at 8h. 32′ 40″ Apparent Time, was likewiſe ſeen at *Wanſted* in a 15 Foot Tube at 9h. 10′ 5″ Apparent Time, the Air being a little hazy, which may probably make the Difference 37′ 25″ a little too great.

The Emerſion ſeen at *Lisbon Jan.* 16, 1726, N. S. at 6h. 51′ 10″, which ſeems accompanied with Circumſtances that argue its Exactneſs, was likewiſe very well obſerved at *Wanſted* in a 15 Foot Tube at 7h. 28′ 22″ Apparent Time, the Difference being 37′ 12″.

Theſe are the only Obſervations among thoſe which were laſt communicated, that I could compare with any degree of Certainty with my own: But I find others printed in the *Philoſoph. Tranſact.* N°. 385, which were likewiſe made by the ſame curious Perſons, who obſerved an Emerſion of the Firſt Satellite at *Lisbon*

September 2, 1724, N.S. at 9h. 36′ 57″. This was ſeen alſo at *Wanſted* in the Reflecter at 10h. 13′ 28″ Apparent Time. Hence, allowing for the different Teleſcopes, the Difference of Meridians is 36′ 45″.

This Emerſion at *Wanſted* preceded the Calculation by the Tables 4′ 40″: And another Emerſion obſerved with the ſame Teleſcope on *Sept.* 18, *N.S.* preceded the Calculation 5′ 10″. We may therefore ſuppoſe, that on *Sept.* 9, N.S. the true Emerſion at *Wanſted* preceded the computed about 4′ 52″. The Emerſion that Day by the Tables was at 12h. 15′ 34″ App. Time; therefore the true Emerſion at *Wanſted* was at 12h. 10′ 42″. At *Lisbon* twas obſerved at 11h. 34′ 26″ So that allowing for the Difference of Teleſcopes, the Difference of Meridians by this Obſervation is 36′ 30″.

The Mean of all theſe Differences is about 36′ 58″, from which ſubſtracting 28″ for the Difference of Meridians between *London* and *Wanſted*, the remainder will be the Difference of Meridians between *London* and *Lisbon*, viz. $36'\frac{1}{2}=9^{\circ}\ 7'\ \frac{1}{2}$, *Lisbon* being ſo much to the Weſtward of *London*. This Difference of Longitude is about $5'\ \frac{1}{2}$ greater than what is determined in the forementioned *Tranſaction*: But as the Gentlemen to whom we are indebted for theſe Obſervations, have given us hopes that they will continue to make and communicate more, we need not doubt but their exact Care and Diligence will ſoon enable us to judge yet more nicely of the true Situation of thoſe Cities with reſpect to each other.

The ſame *Tranſaction* containing ſome Obſervations of Eclipſes of the ſame Satellite made in the Fort of *New York*, communicated by his Excellency *William Burnet*, Eſq; Governor of *New York*, I ſhall take this Oppor-

Opportunity of determining the Longitude of that Fort more exactly than it can be ſuppoſed to be there done, by the bare Compariſon of the Obſervations with the Tables; having two Obſervations made at *Wanſted*, which tally with two made at *New York*, on *Aug.* 25, and *Sept.* 10.

By the Obſervation made *Aug.* 25, 1723, O. S. which is eſteemed the moſt diſtinct and beſt, the Satellite Emerged at 9h. 35′ 14″ by the Clock, which went about 1′ ¼ too faſt for the Apparent Time at the Emerſion, as appears by the Altitudes of the Sun's Limb taken the Morning before and after the Obſervation; ſo that the Emerſion at *New York* was at 9h. 34′ Apparent Time; that is, 9h. 32′ 20″ Mean Time.

Auguſt 27, 8h. 57′ 40″ Mean Time, the Satellite was ſeen emerging at *Wanſted* in the Reflecter; and *Sept* 12, 7h. 17′ 15″ M. T. 'twas ſeen emerging again in the ſame Teleſcope: So that in 15d. 22h. 19′ 35″ there were 9 Emerſions; and the Interval between each was about 1 d. 18h. 28′ 50″. This ſubſtracted from the Time of the Emerſion obſerv'd at *Wanſted Auguſt* 27, will give the true Emerſion at *Wanſted* on *Auguſt* 25, 14h. 28′ 50″ M. T. that is, 4h. 56′ 30′ later than it was obſerved at *New York*.

September 10, 8 h. 0′ 10″ by the Clock, another Emerſion was obſerved at *New York*. From the Altitudes of the Sun's Limb taken the Morning before, I compute the Error of the Clock at the time of the Emerſion to be 1′ 10″, and that the Emerſion happen'd at 7h. 59′ App. T. that is, 7h. 51′ 52″ Mean Time at *New York*. But ſubſtracting the forementioned Interval of 1 d. 18 h. 28′ 50″ from the Time of the Emerſion obſerved at *Wanſted September* 12, 7h. 17′ 15″ M. T. we ſhall have the time of the true Emerſion at *Wanſted* on *Sept.* 10, at 12h. 48′ 25″ M. T. which

which is 4h. 56′ 33″ later than 'twas obſerved at *New York*. The Difference therefore of Meridians between *Wanſted* and *New York*, allowing about 15″ for the Difference of Teleſcopes, is about 4h. 56′ 45″, and between *London* and *New York*, 4h. 56′ ¼. So that the true Longitude of *New York* from *London* is 74° 4′ Weſt.

II. *Obſervationes Aſtronomicæ habitæ* Ulyſſipone, *Anno* 1725, *&* *ſub init.* 1726, *à Rev. P.* Johanne Baptiſta Carbone, *Soc. Jeſ. Communicante* Iſaaco Sequeyra Samuda, *M.D. R.S.S. Coll. Med. Lond. Lic.*

Temp. Ver. correct. à Meridie.

Rarò cælum hoc anno nubibus expers contemplari licuit. Tunc verò vel maximè turbatum ſenſimus, cum aliquid ſpectatu dignum propiùs immineret; ut meritò crederem, omnes nobis hoc anno obſervationes Aſtronomicas fuiſſe interdictas. Perpaucas tandem habere datum eſt circa conſuetas intimi Jovis Satellitis Eclipſes, quas hìc ſubnecto, Lunari Eclipſi, die 21 Octobris, Martiſque tranſitu per Lunam, die 18 Septembris, omninò inobſervatis.

Menſ.	*Dies.*		*H.*	*M.*	*S.*
Jul.	28.	Immergi viſus eſt in umbram Jovis veram,	12	12	26
		teleſcopio conſueto Joſephi Campani palmorum Rom. 30. Ceperat verò debilitari lumen,	12	11	35

Emerſit